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HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2013

MATHEMATICS Compulsory Part
PAPER 2

11.30 am – 12.45 pm (1¼ hours)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.

2. When told to open this book, you should check that all the questions are there. Look for the words **'END OF PAPER'** after the last question.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS**. You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.

5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.

6. No marks will be deducted for wrong answers.

Not to be taken away before the end of the examination session

There are 30 questions in Section A and 15 questions in Section B.
The diagrams in this paper are not necessarily drawn to scale.
Choose the best answer for each question.

Section A

1. $(27 \cdot 9^{n+1})^3 =$

   A. 3^{6n+12}.

   B. 3^{6n+15}.

   C. 3^{9n+12}.

   D. 3^{9n+18}.

2. If $\frac{y-1}{c} = \frac{y+1}{d}$, then $y =$

   A. $\frac{c-d}{c+d}$.

   B. $\frac{d-c}{c+d}$.

   C. $\frac{c+d}{c-d}$.

   D. $\frac{c+d}{d-c}$.

3. $h\ell - k\ell + hm - km - hn + kn =$

   A. $(h+k)(\ell - m + n)$.

   B. $(h+k)(\ell + m - n)$.

   C. $(h-k)(\ell - m + n)$.

   D. $(h-k)(\ell + m - n)$.

4. $0.0504545 =$

A. 0.051 (correct to 2 significant figures).

B. 0.0505 (correct to 3 decimal places).

C. 0.05045 (correct to 4 significant figures).

D. 0.05046 (correct to 5 decimal places).

5. The solution of $x-\frac{x-1}{2}>5$ or $1<x-11$ is

A. $x>9$.

B. $x>10$.

C. $x>11$.

D. $x>12$.

6. Let k be a constant. Solve the equation $(x-k)^2=4k^2$.

A. $x=3k$

B. $x=5k$

C. $x=-k$ or $x=3k$

D. $x=-3k$ or $x=5k$

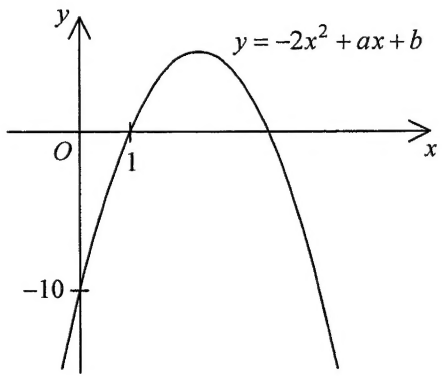
7. The figure shows the graph of $y=-2x^2+ax+b$, where a and b are constants. The equation of the axis of symmetry of the graph is

A. $x=2$.

B. $x=3$.

C. $x=5$.

D. $y=8$.



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8. If a, b and c are non-zero constants such that $x(x+3a)+a \equiv x^2+2(bx+c)$, then $a:b:c=$

A. $2:3:1$.

B. $2:3:4$.

C. $3:2:6$.

D. $6:4:3$.

9. Let $f(x)=x^{13}-2x+k$, where k is a constant. If $f(x)$ is divisible by $x+1$, find the remainder when $f(x)$ is divided by $x-1$.

A. 0

B. -1

C. 2

D. -2

10. Susan sells two cars for $\$80\,080$ each. She gains 30% on one and loses 30% on the other. After the two transactions, Susan

A. loses $\$15\,840$.

B. gains $\$5\,544$.

C. gains $\$10\,296$.

D. has no gain and no loss.

11. A sum of $\$50\,000$ is deposited at an interest rate of 8% per annum for 1 year, compounded monthly. Find the interest correct to the nearest dollar.

A. $\$4\,000$

B. $\$4\,122$

C. $\$4\,143$

D. $\$4\,150$

12. The actual area of a playground is $900\ m^2$. If the area of the playground on a map is $36\ cm^2$, then the scale of the map is

A. $1:25$.

B. $1:50$.

C. $1:500$.

D. $1:250\,000$.

13. It is given that z varies directly as x and inversely as $\sqrt{y}$. If y is decreased by 64% and z is increased by 25%, then x

A. is increased by 20%.

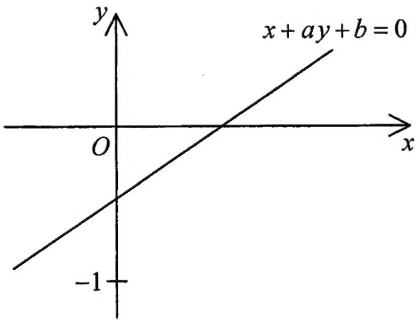
B. is increased by 80%.

C. is decreased by 25%.

D. is decreased by 75%.

14. The figure shows the graph of the straight line $x+ay+b=0$. Which of the following are true?

I. $a<0$
II. $b<0$
III. $a<b$



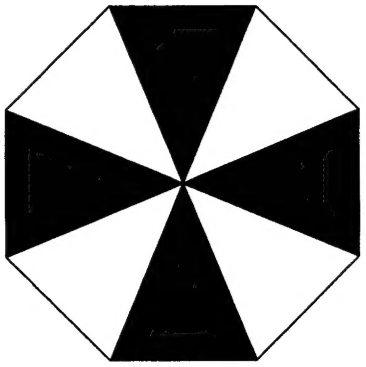
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

15. In the figure, the regular octagon is divided into eight identical isosceles triangles and four of them are shaded. The number of axes of reflectional symmetry of the octagon is



A. 2.

B. 4.

C. 8.

D. 16.

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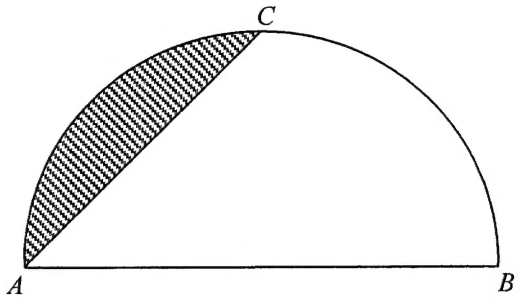
16. In the figure, the diameter of the semicircle ABC is 3 cm. If $AC = 2\text{ cm}$, find the area of the shaded region correct to the nearest 0.01 cm^2.

A. 0.23 cm^2

B. 0.52 cm^2

C. 0.64 cm^2

D. 1.07 cm^2



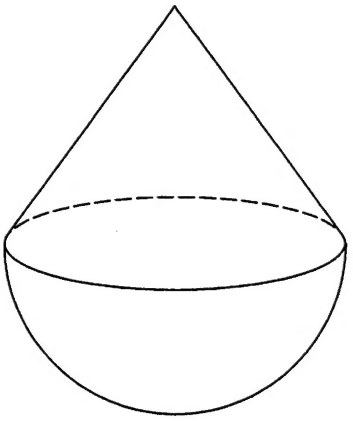
17. In the figure, the solid consists of a right circular cone and a hemisphere with a common base. The base radius and the height of the circular cone are 3 cm and 4 cm respectively. Find the total surface area of the solid.

A. $30\pi\text{ cm}^2$

B. $33\pi\text{ cm}^2$

C. $48\pi\text{ cm}^2$

D. $51\pi\text{ cm}^2$



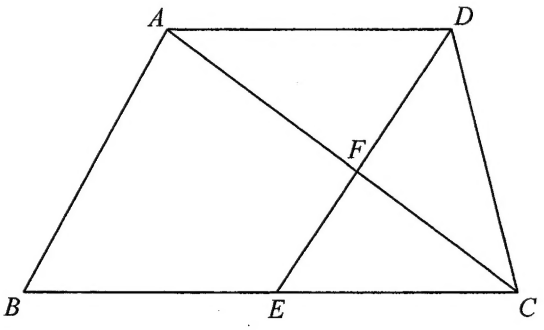
18. In the figure, $ABCD$ is a trapezium with $AD // BC$ and $AD : BC = 2 : 3$. Let E be the mid-point of BC. AC and DE intersect at F. If the area of ΔCEF is 36 cm^2, then the area of the trapezium $ABCD$ is

A. 216 cm^2.

B. 264 cm^2.

C. 280 cm^2.

D. 320 cm^2.



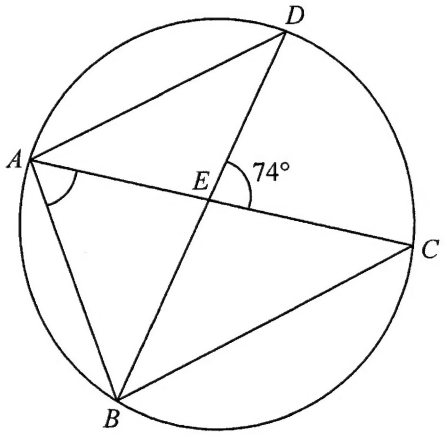
19. In the figure, $ABCD$ is a circle. AC and BD intersect at E. If $AB = AD$ and $AD // BC$, then $\angle BAE =$

A. $53°$.

B. $57°$.

C. $69°$.

D. $74°$.



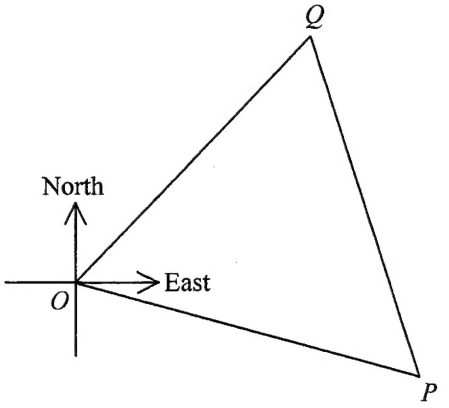
20. In the figure, the bearing of P from O is S86°E and the bearing of Q from O is N32°E. If P and Q are equidistant from O, then the bearing of P from Q is

A. N24°W.

B. N27°W.

C. S24°E.

D. S27°E.



21. If an interior angle of a regular n-sided polygon is 4 times an exterior angle of the polygon, which of the following is/are true?

I. The value of n is 10.
II. The number of diagonals of the polygon is 10.
III. The number of folds of rotational symmetry of the polygon is 10.

A. I only

B. II only

C. I and III only

D. II and III only

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22. In ΔABC, $AB:BC:AC=8:15:17$. Find $\cos A:\cos C$.

A. $8:15$

B. $8:17$

C. $15:8$

D. $15:17$

23. If $0°<x<90°$, which of the following must be true?

I. $\tan x \tan(90°-x)=1$
II. $\sin x-\sin(90°-x)<0$
III. $\cos x+\cos(90°-x)>0$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

24. The coordinates of the points A and B are $(2,5)$ and $(4,-1)$ respectively. Let P be a moving point in the rectangular coordinate plane such that $AP=BP$. Find the equation of the locus of P.

A. $x-3y+3=0$

B. $x-3y-7=0$

C. $x-3y+13=0$

D. $3x+y-11=0$

25. The equation of the circle C is $2x^2+2y^2-4x+8y-5=0$. The coordinates of the points P and Q are $(-1,2)$ and $(4,0)$ respectively. Which of the following is/are true?

I. The radius of C is 5.
II. The mid-point of PQ lies outside C.
III. If G is the centre of C, then $\angle PGQ$ is an acute angle.

A. I only

B. II only

C. I and III only

D. II and III only

26. Two numbers are randomly drawn at the same time from seven cards numbered 1 , 2 , 3 , 4 , 5 , 6 and 7 respectively. Find the probability that the product of the numbers drawn is an odd number.

A. $\frac{2}{7}$

B. $\frac{4}{7}$

C. $\frac{12}{49}$

D. $\frac{16}{49}$

27. If the mean and the mode of the nine numbers 14 , 6 , 4 , 5 , 7 , 5 , x , y and z are 8 and 14 respectively, then the median of these nine numbers is

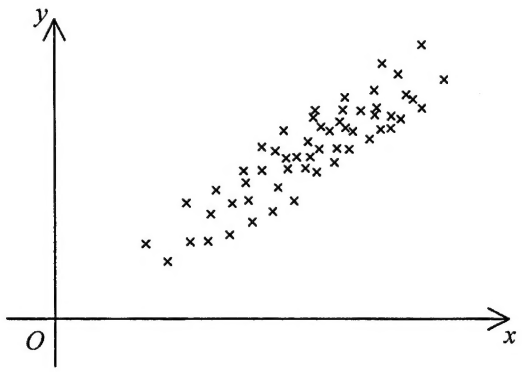
A. 5 .

B. 6 .

C. 7 .

D. 8 .

28. The scatter diagram below shows the relation between x and y . Which of the following may represent the relation between x and y ?



A. y increases when x increases.

B. y decreases when x increases.

C. y varies inversely as x^2 .

D. y varies directly as x^{-3} .

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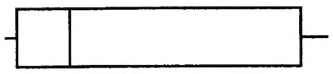
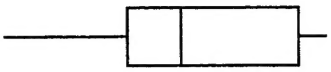
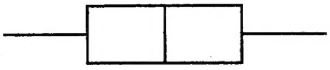
29. The stem-and-leaf diagram below shows the distribution of the hourly wages (in dollars) of some workers.

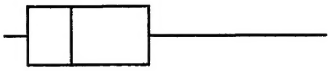
Stem (tens)	Leaf (units)							
4	0	2	2	2	4	4	4	7
5	0	0	1	2	2	6	8	9
6	3	5	5	7				
7	0							
8	2	6						
9	5							

Which of the following box-and-whisker diagrams may represent the distribution of their hourly wages?

A. 

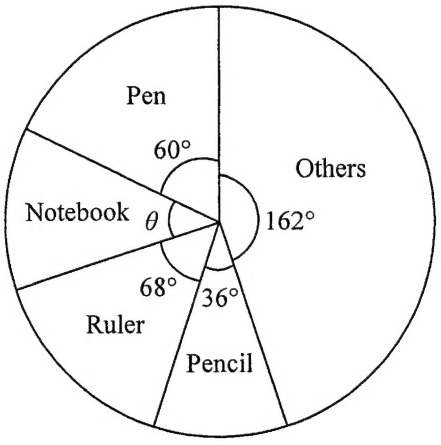
B. 

C. 

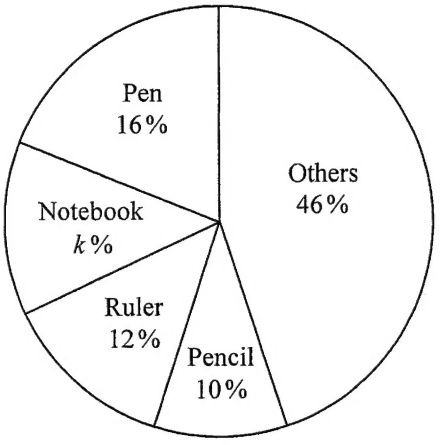
D. 

30. The pie charts below show the distributions of the profits of stationery shop X and stationery shop Y from the sales of stationery in a certain month. Which of the following must be true?

Distribution of the profits of stationery shop X



Distribution of the profits of stationery shop Y



A. In that month, the profit from the sales of pencils of stationery shop X is the same as that of stationery shop Y.

B. In that month, the total profit from the sales of pens and notebooks of stationery shop X is less than the total profit from the sales of rulers and pencils of the shop.

C. $k = 14$

D. $\theta = 36°$

Section B

31. The L.C.M. of a^2+4a+4, a^2-4 and a^3+8 is

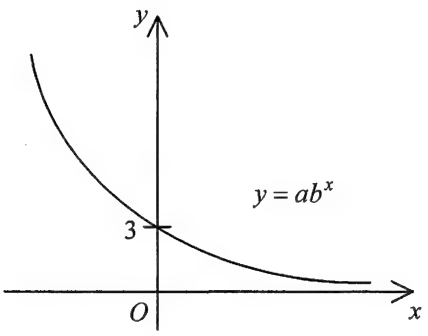
A. $a+2$.

B. $(a-2)(a+2)^2(a^2-2a+4)$.

C. $(a-2)(a+2)^2(a^2+2a+4)$.

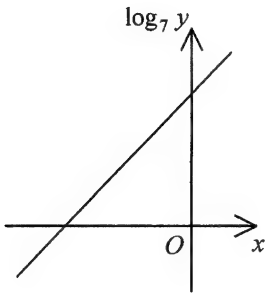
D. $(a-2)(a+2)^4(a^2-2a+4)$.

32.

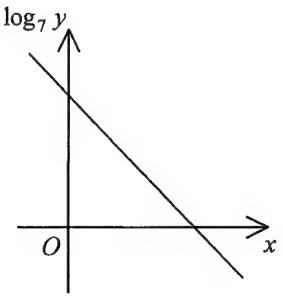


The figure above shows the graph of $y=ab^x$, where a and b are constants. Which of the following graphs may represent the relation between x and $\log_7 y$?

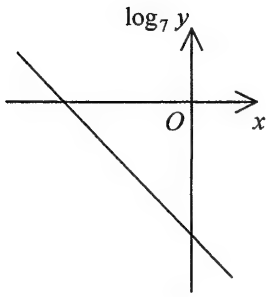
A.



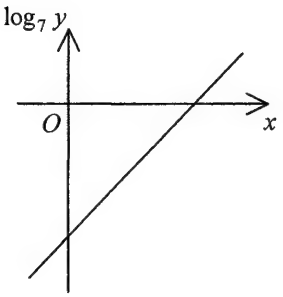
B.



C.



D.



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33. $A00000E00011_{16} =$

A. $10\times16^{11}+14\times16^{5}+17$.

B. $11\times16^{11}+15\times16^{5}+17$.

C. $10\times16^{12}+14\times16^{6}+272$.

D. $11\times16^{12}+15\times16^{6}+272$.

34. If $x-\log y=x^2-\log y^2-10=2$, then $y=$

A. 100 .

B. 2 or -4 .

C. $\frac{1}{100}$ or 10 000 .

D. $\frac{1}{10\,000}$ or 100 .

35. If $\alpha\neq\beta$ and $\begin{cases}3\alpha=\alpha^2-5\\3\beta=\beta^2-5\end{cases}$, then $\alpha\beta=$

A. 3 .

B. -3 .

C. 5 .

D. -5 .

36. The real part of $i+2i^2+3i^3+4i^4$ is

A. 2 .

B. -2 .

C. 6 .

D. -6 .

37. Consider the following system of inequalities:

$$\begin{cases} x \geq 2 \\ y \geq 0 \\ x+4y \leq 22 \\ 4x-y \leq 20 \end{cases}$$

Let D be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in D, then the greatest value of $3y-4x+15$ is

A. 3 .

B. 17 .

C. 22 .

D. 30 .

38. The nth term of a sequence is $2n-19$. Which of the following is/are true?

I. 25 is a term of the sequence.
II. The sequence has 10 negative terms.
III. The sum of the first n terms of the sequence is n^2-18n .

A. I only

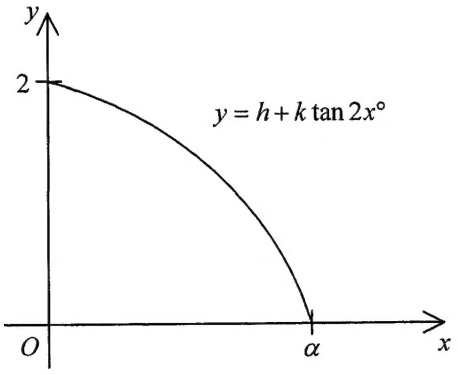
B. II only

C. I and III only

D. II and III only

39. Let h and k be constants. The figure shows the graph of $y = h + k\tan 2x°$, where $0 \le x \le \alpha$. Which of the following are true?

I. $h > 0$
II. $k < 0$
III. $\tan \alpha° = \frac{1}{k}$



A. I and II only

B. I and III only

C. II and III only

D. I, II and III

40. If the height of a regular tetrahedron is 2 cm, then the volume of the tetrahedron is

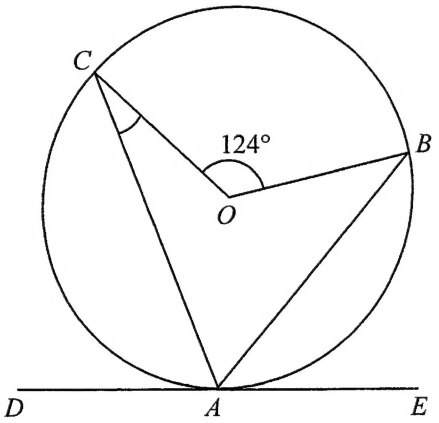
A. $2\ \text{cm}^3$.

B. $\sqrt{3}\ \text{cm}^3$.

C. $\sqrt{6}\ \text{cm}^3$.

D. $3\sqrt{3}\ \text{cm}^3$.

41. In the figure, O is the centre of the circle ABC. DE is the tangent to the circle at A. If AB is the angle bisector of $\angle CAE$, then $\angle ACO =$



A. $26°$.

B. $28°$.

C. $31°$.

D. $34°$.

42. Find the range of values of k such that the circle $x^2+y^2+2x-2y-7=0$ and the straight line $3x-4y+k=0$ intersect.

A. $-8<k<22$

B. $-8\leq k\leq 22$

C. $k<-22$ or $k>8$

D. $k\leq -22$ or $k\geq 8$

43. Let O be the origin. If the coordinates of the points A and B are $(0,12)$ and $(30,12)$ respectively, then the y-coordinate of the circumcentre of ΔOAB is

A. 6.

B. 8.

C. 12.

D. 15.

44. If the first three digits and the last five digits of an eight-digit phone number are formed by a permutation of $5,6,9$ and a permutation of $2,3,4,7,8$ respectively, how many different eight-digit phone numbers can be formed?

A. 15

B. 126

C. 720

D. 40 320

45. If the variance of the five numbers x_1, x_2, x_3, x_4 and x_5 is 13, then the variance of the five numbers $3x_1+4$, $3x_2+4$, $3x_3+4$, $3x_4+4$ and $3x_5+4$ is

A. 39.

B. 43.

C. 117.

D. 121.

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